



InterLab®

Final Report on GI0643

Report Reference: MDE_OPTI_1101_FCCc

acc. Title 47 CFR chapter I part 15 subpart B

Date: September 30, 2011

Test Laboratory:

7Layers AG
Borsigstr. 11
40880 Ratingen
Germany



Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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Chairman of the Supervisory Board:
Markus Becker
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Dr. H.-J. Meckelburg

Registergericht • registered in:
Düsseldorf, HRB 44096
USt-IdNr • VAT No.:
DE 203159652
TAX No. 147/5869/0385

1 Administrative Data

1.1 Project Data

Project Responsible: Yao Jing
Date Of Test Report: 2011/09/30
Date of first test: 2011/07/18
Date of last test: 2011/08/08

1.2 Applicant Data

Company Name: Option nv
Street: Gaston Geenslaan 14,
City: B-3001 Leuven
Country: Belgium
Contact Person: Mr. Jan Willems
Phone: +32 16 311 516
E-Mail: j.willems@option.com

1.3 Test Laboratory Data

The following list shows all places and laboratories involved for test result generation:

7 layers DE

Company Name : 7 layers AG
Street : Borsigstrasse 11
City : 40880 Ratingen
Country : Germany
Contact Person : Mr. Michael Albert
Phone : +49 2102 749 201
Fax : +49 2102 749 444
E Mail : michael.albert@7Layers.de

Laboratory Details

| <i>Lab ID</i> | <i>Identification</i> | <i>Responsible</i> | <i>Accreditation Info</i> |
|---------------|-----------------------|---|---|
| Lab 1 | Conducted Emissions | Mr. Robert Machulec Mr. Andreas Petz | DAkKS-Registration no. D-PL-12140-01-01 |
| Lab 2 | Radiated Emissions | Mr. Robert Machulec Mr. Andreas Petz | DAkKS-Registration no. D-PL-12140-01-01 |

1.4 Signature of the Testing Responsible

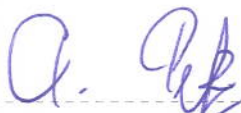


Robert Machulec
responsible for tests performed in: Lab 1, Lab 2



7 layers AG, Borsigstr. 11
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Phone +49 (0)2102 749 0

1.5 Signature of the Accreditation Responsible



Accreditation scope responsible person
responsible for Lab 1, Lab 2

[A. Petz]

2 Test Object Data

2.1 General OUT Description

The following section lists all OUTs (Object's Under Test) involved during testing.

OUT: GI0643

| | |
|--------------------------|---------------------------|
| Product Category: | Computer Accessory |
| Manufacturer: | |
| Company Name: | Please see applicant data |
| Contact Person: | . |

Parameter List:

| Parameter name | Value |
|----------------|-------|
|----------------|-------|

2.2 Detailed Description of OUT Samples

Sample : b01

| | |
|---------------------------|------------|
| <i>OUT Identifier</i> | GI0643 |
| <i>Sample Description</i> | USB modem |
| <i>Serial No.</i> | YM29B2B548 |
| <i>HW Status</i> | 2.0.2.0 |
| <i>SW Status</i> | 2.1.1.0x |
| <i>Date of Receipt</i> | 2011/06/20 |
| <i>Nominal Voltage</i> | 5 V |

2.3 OUT Features

Features for OUT: GI0643

| <i>Designation</i> | <i>Description</i> | <i>Allowed Values</i> | <i>Supported Value(s)</i> |
|-----------------------------------|--|-----------------------|---------------------------|
| Features for scope: FCC_v2 | | | |
| DC | The OUT is powered by or connected to DC Mains | | |
| EDGE850 | EUT supports EDGE in the band 824 MHz - 849 MHz | | |
| EDGE1900 | EUT supports EDGE in the band 1850 MHz - 1910 MHz | | |
| FDD2 | EUT supports UMTS FDD2 in the band 1850 MHz - 1910 MHz | | |
| GSM850 | EUT supports GSM850 band 824MHz - 849MHz | | |
| HSDPA-FDD2 | EUT supports UMTS FDD2 HSDPA in the band 1850 MHz - 1910 MHz | | |
| HSUPA-FDD2 | EUT supports UMTS FDD2 HSUPA in the band 1850 MHz - 1910 MHz | | |
| Iant | Integral Antenna: permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment | | |
| PantC | permanent fixed antenna connector, which may be built-in, designed as an indispensable part of the equipment | | |
| PCS1900 | EUT supports PCS1900 band 1850MHz - 1910MHz | | |
| Wb | EUT supports WLAN in mode b in the band 2400 MHz - 2483.5 MHz | | |
| Wg | EUT supports WLAN in mode g in the band 2400 MHz - 2483.5 MHz | | |
| Wn | EUT supports WLAN in mode n in the band 2400 MHz - 2483.5 MHz | | |

2.4 Auxiliary Equipment

| AE No. | Type Designation | Serial No. | HW Status | SW Status | Description |
|--------|-----------------------|----------------|------------------|-----------|--------------------------|
| AE 6 | Cherry RS 6000 USB ON | G 0000273 2P28 | - | - | Keyboard |
| AE 2 | LG Flatron L1740BQ | 509WANF1W607 | FCC ID: BEJL17NU | - | TFT |
| AE 5 | Logitech M-BB48 | LZC90505478 | - | - | Mouse |
| AE 1 | Medion MD 83053 | MSN: 5003 7805 | 06/27/11 | - | AC/DC USB travel adapter |
| AE 4 | Toshiba PA3378E-3AC3 | - | - | - | AC Adapter |
| AE 3 | Toshiba TECRA M9 | 87060248H | - | - | Laptop |

2.5 Operating Mode(s)

| Ref.-No. | Description |
|----------|--|
| 1 | GSM850 TCH190 (836.6MHz), WLAN active, powered by AE 3 at 120 V AC |
| 2 | GSM1900 TCH661 (1880.0MHz), WLAN active, powered by AE 3 at 120 V AC |
| 3 | GSM850 TCH190 (836.6MHz), WLAN active, powered by AE 1 at 120 V AC |

2.6 Setups used for Testing

For each setup a relation is given to determine if and which samples and auxiliary equipment is used. The left side list all OUT samples and the right side lists all auxiliary equipment for the given setup.

| Setup No. | List of OUT samples | | List of auxiliary equipment | |
|---------------------|---------------------|--------------------|-----------------------------|--------------------------|
| | Sample No. | Sample Description | AE No. | AE Description |
| S01_B01_ACDC | | | | |
| | Sample: b01 | USB modem | AE 1 | AC/DC USB travel adapter |
| S01_B01_Comp | | | | |
| | Sample: b01 | USB modem | AE 6 | Keyboard |
| | | | AE 2 | TFT |
| | | | AE 5 | Mouse |
| | | | AE 4 | AC Adapter |
| | | | AE 3 | Laptop |

3 Results

3.1 General

Documentation of tested devices:

Available at the test laboratory.

Interpretation of the test results:

The results of the inspection are described on the following pages, where 'Conformity' or 'Passed' means that the certification criteria were verified and that the tested device is conform to the applied standard.

In cases where 'Declaration' is printed, the required documents are available in the manufacturers product documentation.

In cases where 'not applicable' is printed, the test case requirements are not relevant to the specific equipment implementation.

3.2 List of the Applicable Body

(Body for Scope: FCC_v2)

| <i>Designation</i> | <i>Description</i> |
|--|--|
| FCC47CFRChIPART15bRADIO FREQUENCY DEVICES | Part 15, Subpart B - Unintentional Radiators |

3.3 List of Test Specification

| | |
|----------------------------|---|
| <i>Test Specification:</i> | FCC part 2 and 15 |
| <i>Version</i> | 10-1-10 Edition |
| <i>Title:</i> | PART 2 - GENERAL RULES AND REGULATIONS PART 15 - RADIO FREQUENCY DEVICES |



Reference: MDE_OPTI_1101_FCCc

acc. Title 47 CFR chapter I part 15 subpart B

3.4 Summary

Test Case Identifier / Name

Test (condition)

Result

Date of Test

Lab

Ref.

Setup

15b.1 Conducted Emissions (AC Power Line) §15.107

15b.1; Mode = transmit

Passed

2011/08/08

Lab 1

S01_B01_ACDC

operating mode: 3

Passed

2011/08/08

Lab 1

S01_B01_Comp

operating mode: 1

15b.2 Spurious Radiated Emissions §15.109

15b.2; Mode = transmit

Passed

2011/07/18

Lab 2

S01_B01_Comp

operating mode: 2



Reference: MDE_OPTI_1101_FCCc

acc. Title 47 CFR chapter I part 15 subpart B

3.5 Detailed Results

3.5.1 15b.1 Conducted Emissions (AC Power Line) §15.107

Test1: 15b.1; Mode = transmit

| | |
|----------------------------|---|
| <i>Result:</i> | Passed |
| <i>Setup No.:</i> | S01_B01_Comp |
| <i>Date of Test:</i> | 2011/08/08 13:03 |
| <i>Body:</i> | FCC47CFRChIPART15bRADIO FREQUENCY DEVICES |
| <i>Test Specification:</i> | FCC part 2 and 15 |

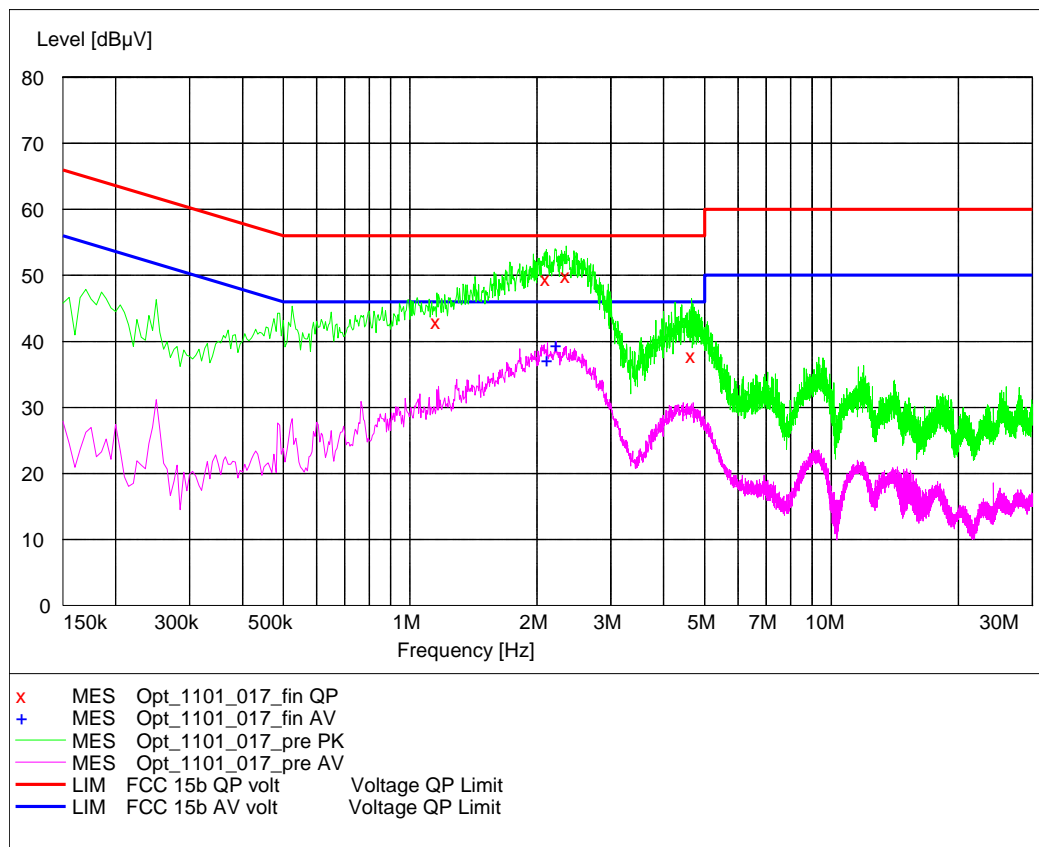
Detailed Results:

AC MAINS CONDUCTED

EUT: (37490b01) + computer periphery
 Manufacturer: Option
 Operating Condition: GSM850 TCH 190, Wlan TX on 2437 MHz 1Mbps
 Test Site: 7 layers Ratingen
 Operator: Doe
 Test Specification: ANSI C63.4; FCC 15.107 / 15.207
 Comment:
 Start of Test: 08.08.2011 / 18:33:15

SCAN TABLE: "FCC Voltage"

| Start | Stop | Step | FCC Voltage | Detector | Meas. Time | IF Bandw. | Transducer |
|-----------|-----------|---------|-------------|----------|------------|-----------|------------|
| Frequency | Frequency | Width | | | | | |
| 150.0 kHz | 30.0 MHz | 5.0 kHz | MaxPeak | | 20.0 ms | 9 kHz | ESH3-Z5 |
| Average | | | | | | | |



MEASUREMENT RESULT: "Opt_1101_017_fin QP"

| Frequency | Level | Transd | Limit | Margin | Line | PE |
|-----------|-------|--------|-------|--------|------|-----|
| MHz | dBμV | dB | dBμV | dB | | |
| 1.160000 | 43.10 | 10.1 | 56 | 12.9 | N | GND |
| 2.105000 | 49.50 | 10.1 | 56 | 6.5 | N | GND |
| 2.350000 | 50.10 | 10.1 | 56 | 5.9 | N | GND |
| 4.660000 | 37.80 | 10.3 | 56 | 18.2 | N | GND |

MEASUREMENT RESULT: "Opt_1101_017_fin AV"

| Frequency | Level | Transd | Limit | Margin | Line | PE |
|-----------|-------|--------|-------|--------|------|-----|
| MHz | dBμV | dB | dBμV | dB | | |
| 2.120000 | 37.30 | 10.1 | 46 | 8.7 | L1 | GND |
| 2.225000 | 39.50 | 10.1 | 46 | 6.5 | N | GND |

Test1: 15b.1; Mode = transmit

Result: Passed
Setup No.: S01_B01_ACDC
Date of Test: 2011/08/08 13:04
Body: FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
Test Specification: FCC part 2 and 15

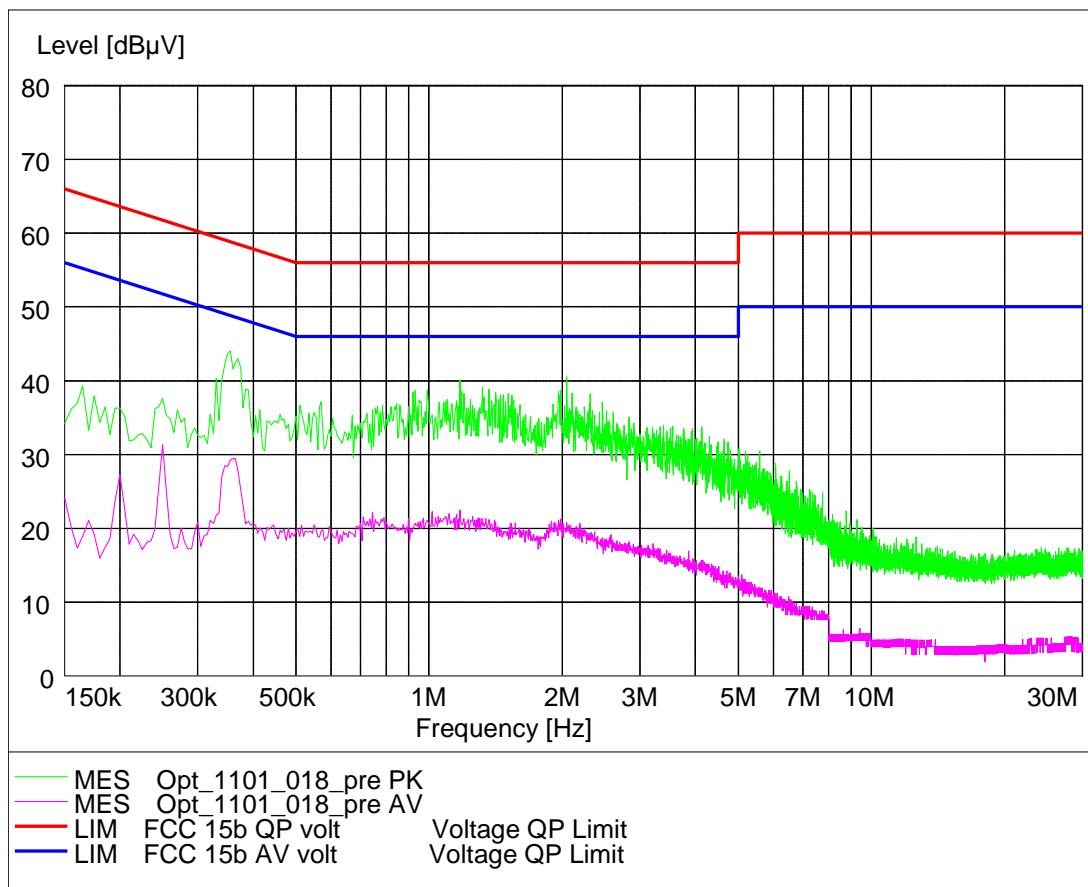
Detailed Results:
AC MAINS CONDUCTED

EUT: (37490b01) + AC/DC USB adapter
 Manufacturer: Option
 Operating Condition: GSM850 TCH 190, WLAN hot-spot function active
 Test Site: 7 layers Ratingen
 Operator: Doe
 Test Specification: ANSI C63.4; FCC 15.107 / 15.207
 Comment:
 Start of Test: 08.08.2011 / 19:15:55

SCAN TABLE: "FCC Voltage"

| Start | Stop | Step | Detector | Meas. Time | IF Bandw. | Transducer |
|-----------|----------|---------|----------|------------|-----------|------------|
| 150.0 kHz | 30.0 MHz | 5.0 kHz | MaxPeak | 20.0 ms | 9 kHz | ESH3-Z5 |

Average





Reference: MDE_OPTI_1101_FCCc

acc. Title 47 CFR chapter I part 15 subpart B

3.5.2 15b.2 Spurious Radiated Emissions §15.109

Test: 15b.2; Mode = transmit

| | |
|----------------------------|---|
| <i>Result:</i> | Passed |
| <i>Setup No.:</i> | S01_B01_Comp |
| <i>Date of Test:</i> | 2011/07/18 11:25 |
| <i>Body:</i> | FCC47CFRChIPART15bRADIO FREQUENCY DEVICES |
| <i>Test Specification:</i> | FCC part 2 and 15 |

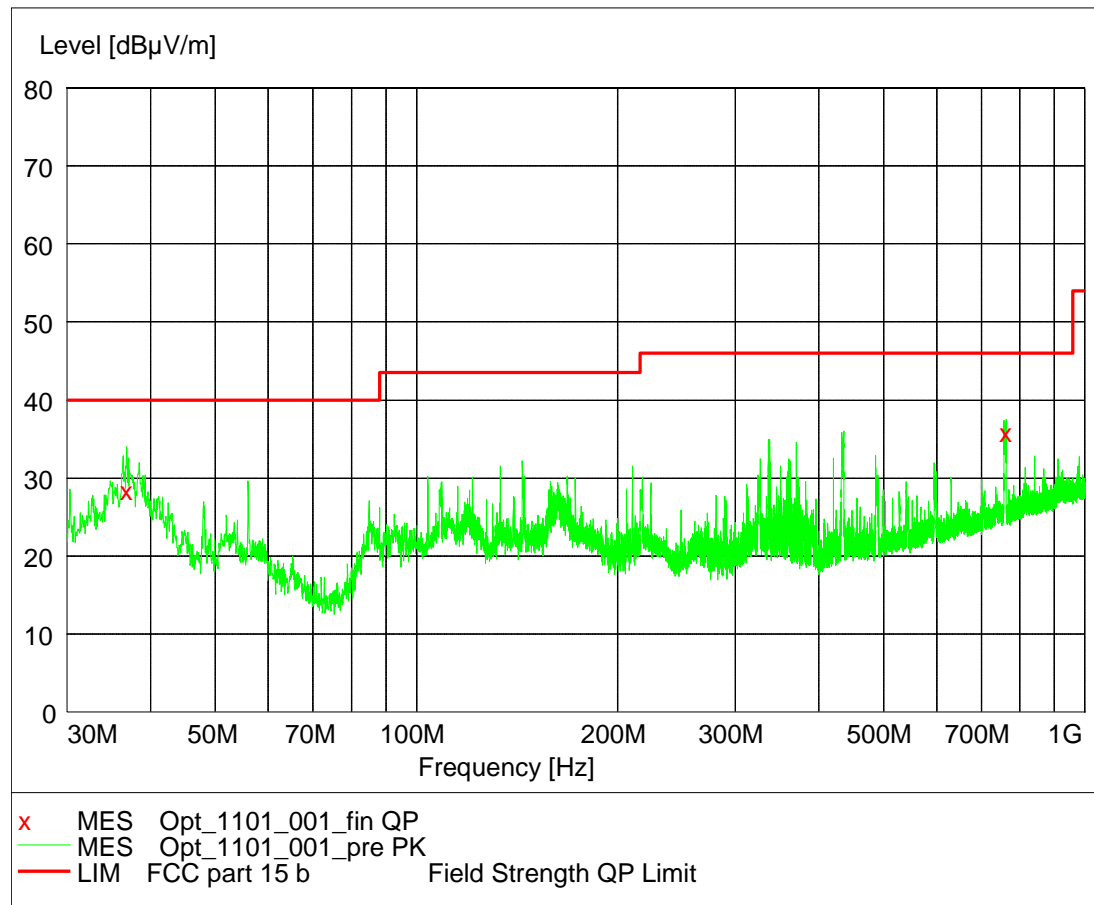
Detailed Results:

EMI RADIATED TEST

EUT: [37490b01]
 Manufacturer: Option
 Operating Condition: GSM 1900 TCH661, Wlan Tx on 2437 MHz 1Mbps
 Test Site: 7 layers, Ratingen
 Operator: Gal
 Test Specification: FCC part 15 b
 Comment: Horizontal EUT position
 Start of Test: 18.07.2011 / 19:36:31

SCAN TABLE: "FCC part 15 b"

Short Description: FCC part 15 b
 Start Stop Step Detector Meas. IF Transducer
 Frequency Frequency Width Time Bandw.
 30.0 MHz 1.0 GHz 60.0 kHz MaxPeak 1.0 ms 120 kHz HL562



MEASUREMENT RESULT: "Opt_1101_001_fin QP"

| Frequency MHz | Level dBμV/m | Transd dB | Limit dBμV/m | Margin dB | Height cm | Azimuth deg | Polarisation |
|------------------|-----------------|--------------|-----------------|--------------|--------------|----------------|--------------|
| 36.840000 | 28.70 | 16.7 | 40.0 | 11.3 | 100.0 | 247.00 | VERTICAL |
| 762.420000 | 36.00 | 22.1 | 46.0 | 10.0 | 193.0 | 202.00 | VERTICAL |

4 Test Equipment Details

4.1 List of Used Test Equipment

The calibration, hardware and software states are shown for the testing period.

Test Equipment Anechoic Chamber

| | |
|----------------------|---------------------------------------|
| Lab ID: | Lab 2 |
| Manufacturer: | Frankonia |
| Description: | Anechoic Chamber for radiated testing |
| Type: | 10.58x6.38x6 m ³ |

Single Devices for Anechoic Chamber

| Single Device Name | Type | Serial Number | Manufacturer |
|---------------------|------------------------------------|---------------|--------------------------------------|
| Air compressor | none | - | Atlas Copco |
| Anechoic Chamber | 10.58 x 6.38 x 6.00 m ³ | none | Frankonia |
| | <i>Calibration Details</i> | | <i>Last Execution Next Execution</i> |
| | FCC listing 96716 3m Part15/18 | | 2011/01/11 2014/01/10 |
| | IC listing 3699A-1 3m | | 2011/02/07 2014/02/06 |
| Controller Maturo | MCU | 961208 | Maturo GmbH |
| EMC camera | CE-CAM/1 | - | CE-SYS |
| EMC camera Nr.2 | CCD-400E | 0005033 | Mitsubishi |
| Filter ISDN | B84312-C110-E1 | | Siemens&Matsushita |
| Filter Universal 1A | BB4312-C30-H3 | - | Siemens&Matsushita |

Test Equipment Auxiliary Equipment for Conducted emissions

| | |
|----------------------|-----------------------------------|
| Lab ID: | Lab 1 |
| Manufacturer: | Rohde & Schwarz GmbH & Co.KG |
| Description: | EMI Conducted Auxiliary Equipment |

Single Devices for Auxiliary Equipment for Conducted emissions

| Single Device Name | Type | Serial Number | Manufacturer |
|---------------------|----------------------------|---------------|--------------------------------------|
| Cable "LISN to ESI" | RG214 | W18.03+W48.03 | Huber&Suhner |
| | <i>Calibration Details</i> | | <i>Last Execution Next Execution</i> |
| | Path Calibration | | 2010/11/06 2011/11/05 |
| Two-Line V-Network | ESH 3-Z5 | 828304/029 | Rohde & Schwarz GmbH & Co. KG |
| Two-Line V-Network | ESH 3-Z5 | 829996/002 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution Next Execution</i> |
| | DKD calibration | | 2008/10/13 2011/10/12 |
| | DKD calibration | | 2011/01/20 2013/01/19 |

Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID: Lab 2
Description: Equipment for emission measurements
Serial Number: see single devices

Single Devices for Auxiliary Equipment for Radiated emissions

| Single Device Name | Type | Serial Number | Manufacturer |
|------------------------------------|------------------------|-----------------------|----------------------------------|
| Antenna mast | AS 620 P | 620/37 | HD GmbH |
| Biconical dipole | VUBA 9117 | 9117-108 | Schwarzbeck |
| | Calibration Details | | Last Execution Next Execution |
| | Standard Calibration | | 2008/10/27 2013/10/26 |
| Broadband Amplifier 18MHz-26GHz | JS4-18002600-32-5P | 849785 | Miteq |
| | Calibration Details | | Last Execution Next Execution |
| | Path Calibration | | 2011/05/11 2011/11/10 |
| Broadband Amplifier 1GHz-4GHz | AFS4-01000400-1Q-10P-4 | - | Miteq |
| | Calibration Details | | Last Execution Next Execution |
| | Path Calibration | | 2011/05/11 2011/11/10 |
| Broadband Amplifier 30MHz-18GHz | JS4-00101800-35-5P | 896037 | Miteq |
| | Calibration Details | | Last Execution Next Execution |
| | Path Calibration | | 2011/05/11 2011/11/10 |
| Cable "ESI to EMI Antenna" | EcoFlex10 | W18.01- 2+W38.01-2 | Kabel Kusch |
| | Calibration Details | | Last Execution Next Execution |
| | Path Calibration | | 2011/05/11 2011/11/10 |
| Cable "ESI to Horn Antenna" | UFB311A+UFB293C | W18.02- 2+W38.02-2 | Rosenberger Micro-Coax |
| | Calibration Details | | Last Execution Next Execution |
| | Path Calibration | | 2011/05/11 2011/11/10 |
| Double-ridged horn | HF 906 | 357357/001 | Rohde & Schwarz GmbH & Co. KG |
| | Calibration Details | | Last Execution Next Execution |
| | Standard Calibration | | 2009/04/16 2012/04/15 |
| Double-ridged horn | HF 906 | 357357/002 | Rohde & Schwarz GmbH & Co. KG |
| | Calibration Details | | Last Execution Next Execution |
| | Standard Calibration | | 2009/04/28 2012/04/27 |
| High Pass Filter | 4HC1600/12750-1.5-KK | 9942011 | Trilithic |
| | Calibration Details | | Last Execution Next Execution |
| | Path Calibration | | 2011/05/11 2011/11/10 |
| High Pass Filter | 5HC2700/12750-1.5-KK | 9942012 | Trilithic |
| | Calibration Details | | Last Execution Next Execution |
| | Path Calibration | | 2011/05/11 2011/11/10 |
| High Pass Filter | 5HC3500/12750-1.2-KK | 200035008 | Trilithic |
| | Calibration Details | | Last Execution Next Execution |
| | Path Calibration | | 2011/05/11 2011/11/10 |
| High Pass Filter | WHKX 7.0/18G-8SS | 09 | Wainwright |
| | Calibration Details | | Last Execution Next Execution |
| | Path Calibration | | 2011/05/11 2011/11/10 |

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

| Single Device Name | Type | Serial Number | Manufacturer |
|---------------------------------|----------------------------|------------------------|--------------------------------------|
| Log.-per. Antenna | HL 562 Ultralog | 830547/003 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution Next Execution</i> |
| | Standard Calibration | | 2009/05/27 2012/05/26 |
| Loop Antenna | HFH2-Z2 | 829324/006 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution Next Execution</i> |
| | DKD calibration | | 2008/10/07 2011/10/06 |
| Network Analyzer | E5071B | MY42200813 | Agilent |
| | <i>Calibration Details</i> | | <i>Last Execution Next Execution</i> |
| | Standard Calibration | | 2010/11/09 2011/11/09 |
| Pyramidal Horn Antenna 26,5 GHz | 3160-09 | 00083069 | EMCO Elektronik GmbH |
| Pyramidal Horn Antenna 40 GHz | 3160-10 | 00086675 | EMCO Elektronik GmbH |
| Tilt device Maturo (Rohacell) | Antrieb TD1.5-10kg | TD1.5-10kg/024/3790709 | Maturo GmbH |

Test Equipment Auxiliary Test Equipment

| | |
|-----------------------|---|
| Lab ID: | Lab 2 |
| Manufacturer: | see single devices |
| Description: | Single Devices for various Test Equipment |
| Type: | various |
| Serial Number: | none |

Single Devices for Auxiliary Test Equipment

| Single Device Name | Type | Serial Number | Manufacturer |
|------------------------------------|----------------------------|---------------|--------------------------------------|
| AC Power Source | Chroma 6404 | 64040001304 | Chroma ATE INC. |
| Broadband Power Divider N (Aux) | 1506A / 93459 | LM390 | Weinschel Associates |
| Broadband Power Divider SMA | WA1515 | A855 | Weinschel Associates |
| Digital Multimeter 03 (Multimeter) | Fluke 177 | 86670383 | Fluke Europe B.V. |
| | <i>Calibration Details</i> | | <i>Last Execution Next Execution</i> |
| | Standard calibration | | 2009/10/07 2011/10/06 |
| Fibre optic link Satellite (Aux) | FO RS232 Link | 181-018 | Pontis |
| Fibre optic link Transceiver (Aux) | FO RS232 Link | 182-018 | Pontis |
| Isolating Transformer | LTS 604 | 1888 | Thalheimer Transformatorenwerke GmbH |
| Notch Filter Ultra Stable (Aux) | WRCA800/960-6EEK | 24 | Wainwright |
| Vector Signal Generator | SMIQ 03B | 832492/061 | Rohde & Schwarz GmbH & Co.KG |

Test Equipment Digital Signalling Devices

Lab ID: Lab 1, Lab 2

Description: Signalling equipment for various wireless technologies.

Single Devices for Digital Signalling Devices

| Single Device Name | Type | Serial Number | Manufacturer |
|--------------------------------------|--|---------------|--------------------------------------|
| Bluetooth Signalling Unit CBT | CBT | 100589 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution Next Execution</i> |
| | Standard Calibration | | 2008/08/14 2011/08/13 |
| Universal Radio Communication Tester | CMU 200 | 102366 | Rohde & Schwarz GmbH & Co. KG |
| | <i>HW/SW Status</i> | | <i>Date of Start Date of End</i> |
| | Hardware: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B56V14, B68 3v04, PCMCIA, U65V04 Software: K21 4v21, K22 4v21, K23 4v21, K24 4v21, K42 4v21, K43 4v21, K53 4v21, K56 4v22, K57 4v22, K58 4v22, K59 4v22, K61 4v22, K62 4v22, K63 4v22, K64 4v22, K65 4v22, K66 4v22, K67 4v22, K68 4v22, K69 4v22 Firmware: µP1 8v50 02.05.06 --- | | 2007/07/16 |
| Universal Radio Communication Tester | CMU 200 | 837983/052 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution Next Execution</i> |
| | Standard calibration | | 2008/12/01 2011/11/30 |
| | <i>HW/SW Status</i> | | <i>Date of Start Date of End</i> |
| | HW options: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B54V14, B56V14, B68 3v04, B95, PCMCIA, U65V02 SW options: K21 4v11, K22 4v11, K23 4v11, K24 4v11, K27 4v10, K28 4v10, K42 4v11, K43 4v11, K53 4v10, K65 4v10, K66 4v10, K68 4v10, Firmware: µP1 8v40 01.12.05 --- | | 2007/01/02 |
| | SW: K62, K69 | | 2008/11/03 |

Test Equipment Emission measurement devices

Lab ID: Lab 1, Lab 2
Description: Equipment for emission measurements
Serial Number: see single devices

Single Devices for Emission measurement devices

| Single Device Name | Type | Serial Number | Manufacturer |
|----------------------------|---------|---------------|--------------------------------------|
| Personal Computer | Dell | 30304832059 | Dell |
| Power Sensor | NRV-Z1 | 836219/005 | Rohde & Schwarz GmbH & Co. KG |
| <i>Calibration Details</i> | | | <i>Last Execution Next Execution</i> |
| Standard Calibration | | | 2009/10/20 2011/10/19 |
| Powermeter | NRVS | 836333/064 | Rohde & Schwarz GmbH & Co. KG |
| <i>Calibration Details</i> | | | <i>Last Execution Next Execution</i> |
| Standard calibration | | | 2009/10/15 2011/10/14 |
| Signal Generator | SMR 20 | 846834/008 | Rohde & Schwarz GmbH & Co. KG |
| Spectrum Analyzer | ESIB 26 | 830482/004 | Rohde & Schwarz GmbH & Co. KG |
| <i>Calibration Details</i> | | | <i>Last Execution Next Execution</i> |
| Standard Calibration | | | 2009/12/03 2011/12/02 |

Test Equipment Shielded Room 02

Lab ID: Lab 1
Manufacturer: Frankonia
Description: Shielded Room for conducted testing
Type: 12 qm
Serial Number: none



Reference: MDE_OPTI_1101_FCCc

acc. Title 47 CFR chapter I part 15 subpart B

5 Annex

5.1 Additional Information for Report

Test Description

Conducted emissions (AC power line)

Standard FCC Part 15 Subpart B

The test was performed according to: ANSI C 63.4, 2009

Test Description

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2009.

The Equipment Under Test (EUT) was setup in a shielded room to perform the conducted emissions measurements in a typical installation configuration. The EUT was powered from 50 μ H || 50 Ohm Line Impedance Stabilization Network (LISN) which meets the requirements of ANSI C63.4-2009, Annex B, in the frequency range of the measurements. The LISN's unused connections were terminated with 50 Ohm loads.

The measurement procedure consists of two steps. It is implemented into the EMI test software ES-K1 from R&S.

Step 1: Preliminary scan

Intention of this step is, to determine the conducted EMI-profile of the EUT.

EMI receiver settings:

- Detector: Peak - Maxhold
- Frequency range: 150 kHz – 30 MHz
- Frequency steps: 5 kHz
- IF-Bandwidth: 9 kHz
- Measuring time / Frequency step: 20 ms
- Measurement on phase + neutral lines of the power cords

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2: Final measurement

Intention of this step is, to determine the highest emissions with the settings defined in the test specification for the frequencies identified in step 1.

EMI receiver settings:

- Detector: Quasi-Peak
- IF - Bandwidth: 9 kHz
- Measuring time: 1 s / frequency

At each frequency determined in step 1, four measurements are performed in the following combinations:

- 1) Neutral lead - reference ground (PE grounded)
- 2) Phase lead - reference ground (PE grounded)
- 3) Neutral lead - reference ground (PE floating)
- 4) Phase lead - reference ground (PE floating)

The highest value is reported.

Test Requirements / Limits

If not stated within the measurement plot and/or test result, class B limits are applied.

FCC Part 15, Subpart B, §15.107, Class B Limit

| Frequency Range (MHz) | QP Limit (dB μ V) | AV Limit (dB μ V) |
|-----------------------|-----------------------|-----------------------|
| 0.15 – 0.5 | 66 to 56 | 56 to 46 |
| 0.5 – 5 | 56 | 46 |
| 5 – 30 | 60 | 50 |

FCC Part 15, Subpart B, §15.107, Class A Limit

| Frequency Range (MHz) | QP Limit (dBµV) | AV Limit (dBµV) |
|-----------------------|-----------------|-----------------|
| 0.15 - 0.5 | 79 | 66 |
| 0.5 - 30 | 73 | 60 |

Used conversion factor: Limit (dBµV) = 20 log (Limit (µV)/1µV).

NOTES:

A missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

The chosen operating mode is selected as representative mode to generate "worst-case" conditions, i.e. high power consumption.

Spurious radiated emissions

Standard FCC Part 15, Subpart B

The test was performed according to: ANSI C 63.4, 2009

Test Description

Measurement below 1 GHz:

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2009.

The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.

The test was performed at the distance of 3 m between the EUT and the receiving antenna. The measurement procedure is implemented into the EMI test software ES-K1 from R&S. The radiated emissions measurements were made in a typical installation configuration. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is performed at 2 axes. A pre-check is also performed while the EUT is powered from both AC and DC (battery) power in order to find the worst-case operating condition.

Step 1: Preliminary scan (test to identify the highest amplitudes relative to the limit)

Intention of this step is, to determine the radiated EMI-profile of the EUT.

Settings for step 1:

- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF-Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 µs
- Turntable angle range: –180° to +180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2:

A further measurement will be performed on the frequencies determined in step 1. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

Settings for step 2:

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms

acc. Title 47 CFR chapter I part 15 subpart B

- Turntable angle range: -180° to $+180^{\circ}$
- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarisation: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):

- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:

- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

Step 3: final measurement

In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.

For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will be slowly varied by $\pm 22.5^{\circ}$ around this value. During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by ± 25 cm around the antenna height determined. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100ms
- Turntable angle range: -22.5° to $+22.5^{\circ}$ around the determined value
- Height variation range: -0.25 m to +0.25 m around the determined value

Step 4: Final measurement (with QP detector)

With the settings determined in step 3, the final measurement will be performed:

EMI receiver settings for step 4:

- Detector: Quasi-Peak(< 1GHz)
- Measured frequencies: in step 3 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

Measurement above 1 GHz:

The following modifications apply to the measurement procedure for the frequency range above 1 GHz:

The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements, inverse-linear-distance-squared for the power density measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18–25 GHz) are used, the steps 2-4 as described before, are omitted. Step 1 was performed at one height of the receiving antenna only.

Detector: Peak, Average (simultaneously)

RBW = VBW = 1 MHz; above 7 GHz 100 kHz

Test Requirements / Limits

If not stated within the measurement plot and/or test result, class B limits are applied.

FCC Part 15, Subpart B, §15.109, Radiated Emission Limits

Frequency Range (MHz): Class B Limit (dB μ V/m)

| Frequency Range (MHz) | Class B Limit (dB μ V/m) |
|-----------------------|------------------------------|
| 30 – 88 | 40.0 |
| 88 – 216 | 43.5 |
| 216 – 960 | 46.0 |
| above 960 | 54.0 |

Frequency Range (MHz) Class A Limit (dB μ V/m) / @ 3m !

| | |
|-----------|------|
| 30 - 88 | 49.5 |
| 88 - 216 | 54.0 |
| 216 - 960 | 56.9 |
| above 960 | 60.0 |

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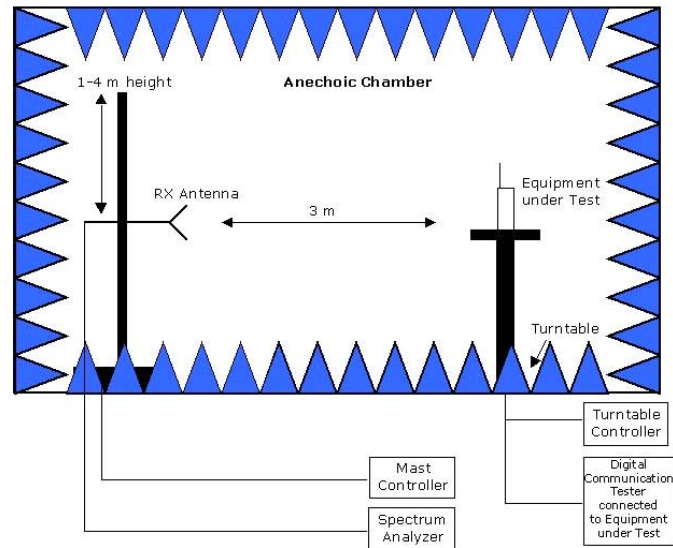
§15.35(b)

..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: $\text{Limit (dB}\mu\text{V/m)} = 20 \log (\text{Limit } (\mu\text{V/m})/1\mu\text{V/m})$

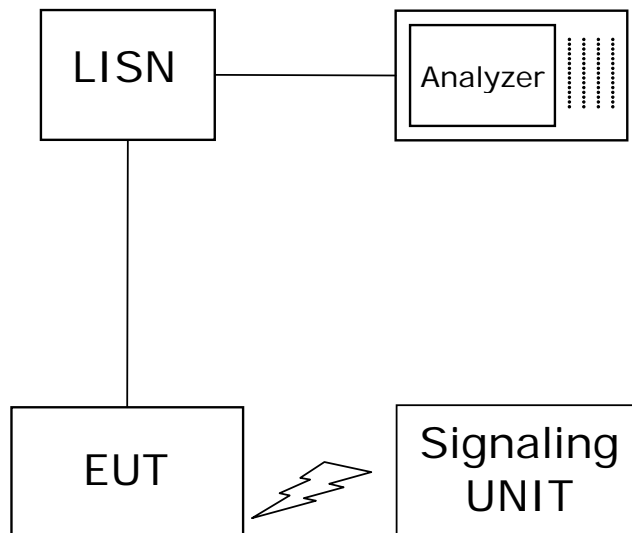
NOTE: A missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

Setup Drawings



Remark: Depending on the frequency range suitable antenna types, attenuators or preamplifiers are used.

Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.



Setup in the shielded room for conducted measurements at AC mains port



6 Index

| | |
|---|----|
| 1 Administrative Data | 2 |
| 1.1 Project Data | 2 |
| 1.2 Applicant Data | 2 |
| 1.3 Test Laboratory Data | 2 |
| 1.4 Signature of the Testing Responsible | 3 |
| 1.5 Signature of the Accreditation Responsible | 3 |
| 2 Test Object Data | 3 |
| 2.1 General OUT Description | 3 |
| 2.2 Detailed Description of OUT Samples | 4 |
| 2.3 OUT Features | 4 |
| 2.4 Auxiliary Equipment | 5 |
| 2.5 Operating Mode(s) | 5 |
| 2.6 Setups used for Testing | 5 |
| 3 Results | 6 |
| 3.1 General | 6 |
| 3.2 List of the Applicable Body | 6 |
| 3.3 List of Test Specification | 6 |
| 3.4 Summary | 7 |
| 3.5 Detailed Results | 8 |
| 3.5.1 15b.1 Conducted Emissions (AC Power Line) §15.107 | 8 |
| 3.5.2 15b.2 Spurious Radiated Emissions §15.109 | 11 |
| 4 Test Equipment Details | 13 |
| 4.1 List of Used Test Equipment | 13 |
| 5 Annex | 18 |
| 5.1 Additional Information for Report | 18 |
| 6 Index | 24 |